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September 20, 2001

Ms. Magalie Roman Salas, Secretary  
Federal Communications Commission  
Office of the Secretary  
445 - 12th Street, S.W. - Room TW-A325  
Washington, D.C. 20554

**RE: CC Docket No. 94-102**

**Petition for E911 Phase III directive to enable effective coverage of buildings interiors**

Dear Ms. Salas:

As we approach the October 1, 2001 E911 Phase II milestone, pulver.com applauds the FCC's Wireless Bureau for the initiative aimed at increasing public safety of mobile telephone users in United States of America. The FCC's initiative will significantly reduce the time required for emergency teams to locate and reach mobile telephone 911 callers due to improved location accuracy called for by the Phase II mandate.

Today, most mobile 911 calls come from callers on the road in open environments where high location accuracy can be achieved. In the coming years, as personal communications will shift from landline telephones to wireless devices, people will expect that their wireless appliances will provide them with emergency services at all locations including multi-story buildings, subway stations and similar structures. Sadly, the need for indoors tracking was clearly demonstrated during the tragic events of September 11, 2001 at the New York World Trade Center.

Large steel and concrete buildings, subways and large malls may be difficult or even impossible to cover using traditional wide area location technologies such as AGPS (Assisted GPS) and TDOA (Time Difference of Arrival). Low signal to noise ratio and signal multipath effects in these environments decrease tracking accuracy or even prevent signal acquisition.

Multiple story buildings pose additional obstacles for tracking, as they require three-dimensional positioning. Even if the longitude and latitude of an individual in a fifty-story building were known with great accuracy, that knowledge would be insufficient because the emergency team may have to search every floor. For an accuracy of 200

meters, the location fix may cover many multi-story buildings. Under these conditions, a rescue team could spend hours just searching for the caller.

Many of the major wireless operators<sup>1,2,3,4,5</sup> chose AGPS solution to meet the E911 Phase II requirements. This technology has several very attractive features. It does not require significant infrastructure changes, and in open environments, it offers accuracy that is unsurpassed by any other technology. Nevertheless, in some urban settings AGPS may not work at all. In evaluating its AGPS tests, Cingular Wireless<sup>6</sup> commented to the FCC, "Although the Snaptrack system performed well in an outdoor environment, indoors test results were extremely poor, effectively negating the outdoor results. Indeed, indoor call yield were so low that meaningful comparison with the Commission's accuracy standards could not be tabulated."

An article in the June 2001 pulver.com Location Based Services Report<sup>7</sup> presented test results of the CoCoSecom AGPS/AFLT (Advanced Forward Link Trilateration) system in Osaka Japan. These results are consistent with Cingular Wireless observation that AGPS provides superior results for outdoor environments and inferior results in indoors settings. The results also indicate that the accuracy of the technology inside large buildings and underground structures would be insufficient to meet the needs of emergency services. It should be noted that CoCoSecom employs QUALCOMM's<sup>8</sup> MSM3300/gpsOne system, which will also be used by some of the US CDMA carriers for their E911 solution.

The issue of indoors tracking has also been addressed by the Coordination Group on Access to Location Information by Emergency Services (CGALIES), whose charter is to explore options for implementing E112 emergency services in the European Union. CGALIES Work Package<sup>9</sup>, released on April 19, 2001 states, "A general description of environments where AGPS is typically demonstrated to work well is: outdoors, in car, in wooden buildings, in two story buildings of brick/slate, and in steel/concrete buildings 1-3 meters from a window."

While our focus here has been on AGPS, we should not ignore other technologies such as TDOA and E-OTD (Enhanced Observed Time Difference of Arrival), which had been adopted by some carriers. These technologies may provide location fixes in difficult indoors environments. Nevertheless, they do not address 3-dimensional positioning, which is required for pinpointing location in multi-story buildings.

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<sup>1</sup> Sprint PCS, "Joint Sprint PCS Phase II Implementation Report", November 9, 2001, Docket No. 94-102.

<sup>2</sup> Nextel, "Nextel Communications, Inc. and Nextel Partners, Inc Joint Report on Phase II Location Technology", November 9, 2000.

<sup>3</sup> Verizon Wireless, "Updated Phase II E911 Report and Request for Limited Waiver", July 25, 2001.

<sup>4</sup> Alltel, "Alltel Communications, Inc. "E911 Phase II Technology Report", November 9, 2000.

<sup>5</sup> Qwest Wireless, "Qwest Wireless, LCC and TW Wireless, LLC Amended Report on Enhanced 911 Phase II Implementation", June 19, 2001, Docket No. 94-102.

<sup>6</sup> Cingular Wireless, "Petition for Limited Waiver", August 31, 2001, Docket No. 94-102

<sup>7</sup> URL <http://pulver.com/lbsreport/bissues.html>

<sup>8</sup> For more information on the CoCoSecom system, see "Written Ex Parte Presentation", April 2001 by QUALCOMM.

<sup>9</sup> CGALIES URL: <http://www.telematica.de/cgalies/>

The preceding discussion makes it quite clear that present technologies selected to meet the E911 Phase II requirements do not address the needs of providing emergency services in large buildings, subways and other difficult urban areas. In these areas, even greater accuracies than those mandated by the FCC are needed to reduce response time to 911 calls. In reality, the opposite is true; inferior accuracies are to be expected in such environments.

To improve the response time to emergency calls in indoors settings, pulver.com requests the FCC to consider issuing a E911 Phase III directive to address the accuracy needs of building and other large structures interiors.

Solving the problem of buildings' interiors may not be easy and will require time. Yet solutions are possible and will be available. One approach that could provide coverage for both indoors and outdoors environments would be to adopt a hybrid solution that combines wide area solutions with local positioning<sup>10</sup> technologies. Local positioning typically uses low-power radio frequency signaling, infrared radiation and inertial tracking technologies.

Local positioning usually requires extensive deployment of fixed position transceiver infrastructure throughout the interior of buildings and other large structures. Such deployment may appear to be an expensive proposition. Yet, the emerging Bluetooth<sup>11</sup> technology may solve the infrastructure problem. In the next few years, it is expected that Bluetooth chipsets would be installed in mobile handsets as well as in fixed-point devices. Fixed-point Bluetooth devices will be deployed in vending and ATM machines and at Internet access points that are placed in commercial and office areas. Such stationary devices could serve as beacons to assist locating mobile Bluetooth devices. Presently, a Bluetooth Special Interest Group (SIG) is developing local positioning standards and usage models for Bluetooth devices.

Local positioning is not the only possible option for buildings' interiors tracking. Most recently, the Rosum Corporation has advised the FCC's Wireless Bureau<sup>12</sup> that it is developing location technology based on timing of digital television (DTV) signals. At the receiving end, DTV signals are several orders of magnitude stronger than their GPS counterparts, thus, increasing their availability in indoors environments.

In situations when indoors positioning is not available or fails, another option for emergency tracking could be achieved through the use of handheld proximity detectors. These devices do not pinpoint the location of the caller. Instead, they point to the direction of the caller. Such devices may not bring the emergency team to the caller as fast as an accurate pinpointing technology would do. However, in the vicinity of the caller, they could be effective tools in rescue operations.

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<sup>10</sup> More information on local positioning is available in the pulver.com September Location Based Services Report at URL: <http://pulver.com/lbsreport/bissues.html>

<sup>11</sup> Information on Bluetooth is available at <http://www.bluetooth.com>

<sup>12</sup> Rosum Corporation, "Ex Parte Communication", June 29, 2001, Docket No. 94-102.

Throughout 2001, pulver.com has been carefully monitoring and analyzing the progress of the wireless carriers for compliance with the FCC's E911 Phase II mandate and has provided this information to the readers of the pulver.com Location Based Services Report. In recent months, the Report has been regularly highlighting the difficulties associated with in-building tracking. The pulver.com Fall 2001 Location Based Services Summit<sup>13</sup>, scheduled for October 29-30, 2001 in Santa Clara, California, also will focus on indoors positioning. pulver.com hopes to continue its education efforts on this topic in future reports and conferences.

Respectfully Submitted,

Jeff Pulver

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Cc: Thomas J. Sugrue, Chief, Wireless Telecommunications Bureau, (Rm. #3-C252)  
Kris Monteith, Chief, Policy Division, WTB (Rm. #3-C124)  
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<sup>13</sup> More information on the Summit is available at <http://www.pulver.com/lbs>